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The Metacognitions about Gambling Questionnaire: Development and psychometric properties

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Abstract

Recent research has suggested that metacognitions may play a role across the spectrum of addictive behaviours. The goal of our studies was to develop the first self-report scale of metacognitions about gambling. We conducted three studies with one community (n=165) and two clinical (n=110; n=87) samples to test the structure and psychometric properties of the Metacognitions about Gambling Questionnaire and examined its capacity to prospectively predict severity of gambling. Findings supported a two factor solution consisting of positive and negative metacognitions about gambling. Internal consistency, predictive and divergent validity were acceptable. All the factors of the Metacognitions about Gambling Questionnaire correlated positively with gambling severity. Regression analyses showed that negative metacognitions about gambling were significantly associated to gambling severity over and above negative affect and gambling-specific cognitive distortions. Finally only gambling severity and negative metacognitions about gambling were significant prospective predictors of gambling severity as measured three months later. The Metacognitions about Gambling Questionnaire was shown to possess good

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psychometric properties, as well as predictive and divergent validity within the populations that were tested.

Key words: gambling disorder; gambling-specific cognitive distortions; metacognition; metacognitions; problematic gambling; psychometric measure

Introduction

Between the fourth and fifth editions of the Diagnostic and Statistical Manual of Mental Disorders (DSM), Pathological Gambling was re-positioned from the Impulse Control Disorders' (ICD) to the Addictions' chapter (American Psychiatric Association, 1994; 2013). Arguably, this shift reflects the changing consensus regarding the significant differences between PG and ICDs in the clinical characteristics and phenomenological experiences associated with these disorders. Of greatest salience is that individuals with ICDs typically report a sense of relief after executing the impulse-driven behaviour whilst those engaging in pathological gambling do not (Shaffer and Korn, 2002). Absence of sense of relief is also accompanied by relevant costs that can give rise to financial, interpersonal, legal and vocational problems for the sufferer, their families and society. Taken together, these considerations give rise to an important question: How is gambling maintained, considering the absence of short-term relief and presence of long-term costs?

A potential answer is provided by behavioural and cognitive approaches to understanding psychopathology. The behavioural approach highlights the role of learning processes like fixed and variable schedules of reinforcement (Dickerson, 1989). The cognitive approach (Sharpe and Tarrier 1993; Ladouceur and Walker 1996) highlights the role of irrational and biased cognitive beliefs. These approaches have provided important insights into the understanding of gambling behaviour however they are not without limitations. In particular, the behavioural approach fails to explain why only a small proportion of the total population of gamblers lose control whilst the cognitive approach fails to establish if irrational beliefs play a causal role rather than being a secondary or epiphenomenal effect of cognitive dissonance.

These theoretical limitations may explain why cognitive-behavioural therapy (CBT), which is the most evaluated approach for treating gambling disorder (GD), has been found to be efficacious (e.g. Toneatto, 2005; Toneatto and Millar, 2004) however only in the short term. Indeed there appears to be "insufficient evidence" to support its efficacy in the longer-term (Cowlishaw et al., 2012, p.32). It has been argued that a possible reason for CBT's lack of efficacy in the longer term might be due to residual symptoms that can remain present at a metacognitive level (Lindberg, Fernie and Spada, 2011; Spada, Giustina, Rolandi, Fernie and Caselli, 2015; Spada, Caselli, Nikčević and Wells, 2015). In particular, the modification of the content of biased cognitive beliefs, that is the main focus of CBT, do not necessarily imply the modification of implicit or explicit cognitive processes (e.g. worry or rumination) that can facilitate a further emergence of biased cognitions and that can be guided by a specific set of knowledge, labelled metacognitions.

Metacognitions (beliefs about cognition and ways of controlling it) are a central construct in the metacognitive model of psychopathology (Wells and Matthews, 1994; 1996). In this model, metacognitions are purported to play a critical role in the activation and persistence of coping strategies (e.g. perseverative thinking, threat monitoring, thought suppression and maladaptive behaviour), which cause negative thoughts and emotions to persist. In support of this view, metacognitions have been found to be associated with a wide array of psychological and behavioural problems (for a full review, see Wells, 2013) in the anxiety and mood disorders. Furthermore, the therapeutic approach based on the metacognitive model of psychopathology, known as Metacognitive Therapy (MCT), appears to be an effective treatment for depression and a range of anxiety disorders, and possibly superior to traditional CBT (Normann, van Emmerik and Morina, 2014).

Within the field of addictive behaviours numerous studies, using cross-sectional, longitudinal, and experimental designs, have linked metacognitions to alcohol use and problem drinking, whilst other studies demonstrated that metacognitions are also linked to nicotine use and dependence (for review see Spada, Caselli, Nikčević and Wells, 2015). Within the area of addictive

behaviours metacognitions can be usefully divided into two broad sets (Spada, Caselli, Nikčević and Wells, 2015; Spada, Caselli and Wells, 2013; Spada and Wells, 2009): (1) positive metacognitions about the benefits of engaging in addictive behaviour as a means of cognitive and affective regulation such as "Using alcohol will help me control bad thoughts" or "If I smoke I will achieve greater levels of clarity in my thinking"; and (2) negative metacognitions concerning the uncontrollability and dangers of thoughts about addictive behaviour and engagement in addictive behaviour such as "I cannot stop thinking about my cigarette use" or "using alcohol will damage my mind". Positive metacognitions have been found to play a central role in motivating individuals to engage in addictive behaviour whilst negative metacognitions are thought be involved in its perpetuation. Negative metacognitions are activated during and following an episode of engagement in an addictive behaviour, triggering difficult cognitive and negative emotional states that compel a person to continue their engagement with it in a maladaptive attempt to regulate these internal states (Spada, Caselli, Nikčević and Wells, 2015).

Recent research has indicated that general metacognitions (specifically, those concerning negative beliefs about the danger and uncontrollability of thoughts and beliefs about the need to control thoughts) predict levels of gambling behaviour when controlling for anxiety and depression (Lindberg, Fernie and Spada, 2011). A further study, which focused on eliciting gambling-specific metacognitions in a sample of pathological gamblers (Spada, Giustina, Rolandi, Fernie and Caselli, 2015), identified that gamblers endorsed both positive and negative metacognitions about gambling. Positive metacognitions about gambling referred to the need to gamble as a strategy to control thinking (e.g. to stop worry). Negative metacognitions about gambling referred to the uncontrollability of gambling activity and dangerousness of gambling-related thoughts. However, the study's design (specifically its small sample size) limited the ability to generalise from its findings.

The current study series builds on these two preliminary works by presenting the development and validation of a self-report questionnaire designed to assess metacognitions in

gambling, the Metacognitions about Gambling Questionnaire (MGQ). The specific aims are as follows:

1. Study 1 aimed at exploring the factor structure of the preliminary version of the MGQ.
2. Study 2 aimed at confirming the structure of the MGQ and examining its predictive and divergent validity.
3. Study 3 aimed at testing the prospective predictive validity of MGQ in a clinical sample.

We hope that with the development of this self-report questionnaire further quantitative research investigating the role of metacognitions in gambling will be facilitated. We also envisage that the questionnaire may prove useful in identifying individuals with maladaptive metacognitive profiles related to gambling.

Study 1: Construction of Metacognitions about Gambling Questionnaire (MGQ)

We conducted a study to explore the factor structure of the preliminary version of the MGQ in a community sample.

Method

Participants

A sample of 165 individuals (75 female) agreed to participate in the study which was approved by the ethics committee of Studi Cognitivi, Italy. For purposes of inclusion participants were required to: (1) be 18 years of age or above; (2) consent to participate; (3) understand spoken and written Italian; and (4) report at least one episode of gambling within the previous two weeks. The mean age of the sample was 39.7 years (SD=13.7 years) and the age range was 19 to 65 years. The majority of the sample (98.0%) self-reported that they were Caucasian. Participants reported mean scores on the South Oaks Gambling Screen (SOGS, Lesieur and Blume, 1987) of 4.4 (SD=2.6), with 11% without problematic gambling, 55% with some difficulties with gambling, 34% with probable pathological gambling.

Measures

Metacognitions about Gambling Questionnaire (MGQ; preliminary version).

The MGQ items representing positive and negative metacognitions about gambling were derived from previous research on profiling metacognitions in gambling disorder (Spada, Giustina, Rolandi, Fernie and Caselli, 2014), as well as from the authors' clinical experience and from deductions based on the metacognitive model of psychopathology (Wells, 2009). The items selected as positive metacognitions concerned the usefulness of gambling in achieving mental regulation (e.g. "Gambling helps to stop thinking about my worries" and "Gambling can help to solve my problems"). The items selected as negative metacognitions concerned the uncontrollability of gambling ("Once I start to gamble I cannot stop") and the dangers of gambling ("If I cannot control gambling I will cease to function"). A total of 30 items were framed in terms of statements to which participants were required to report the extent of their agreement on a four-point Likert-type scale ("Do not agree", "Agree slightly", "Agree moderately", and "Agree very much").

South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987).

The SOGS consists of 20 items designed to assess gambling behaviour and identify individuals who are problem and pathological gamblers. SOGS total scores of zero indicate 'no problem with gambling', scores of one to four indicate 'some problems with gambling', whilst scores of five or above identify 'probable pathological gambling'. Although popular, this self-report questionnaire has not been accepted without criticism related to its construct validity and lack of emphasis on psychological components of gambling disorder (e.g. impaired-control; Battersby, Thomas, Tolchard and Esterman, 2002). However, such criticisms have been addressed with the SOGS having been shown to meet the criterion of validity generalization (Gambino and Lesieur, 2006).

Procedure

Participants were recruited using e-mail lists and advertisements on social network groups and thematic forums. A web link directed the participants to the study website. The first page of the study website explained the purpose of the study: "To develop a self-report questionnaire to assess

beliefs people hold about gambling". Participants were then directed, if consenting to participate in the study, to a second page containing basic demographic questions and the self-report questionnaires. On completion participants were asked to click on the "Submit" button. Once participants had clicked on "Submit", their data was forwarded to a generic postmaster account. This ensured that participants' responses were anonymous. A second submission from the same IP address was not allowed so as to avoid multiple submissions from the same participant.

Results

A principal components method of factor extraction was performed on the scores of the original 30 items. The Scree test suggested a three factor solution (eigenvalues of 10.8, 3.6 and 2.0). Items were assessed as indicators of the latent variables using Varimax rotation. The three factors together accounted for 54.6% of variance. Items which loaded less than 0.4 on any factor were discarded, as were items that loaded on two or more factors. If an item loaded more than 0.4 on one factor, and failed to load onto the other factors, but was within approximately 0.2 of the loading on the first factor, it was also discarded. This procedure was followed in order to exclude items that influenced more than one factor. Only the five items that loaded on each factor were selected to define a brief final version of the self-report questionnaire. The revised self-report questionnaire consisted of 15 items. The factor loadings and communalities of the individual items are presented in Table 1. Internal consistencies (homogeneity) were determined by computing Cronbach's alpha. This coefficient was 0.85 for factor 1, 0.87 for factor 2, and 0.83 for factor 3. All items showed correlations above 0.6 on their own factor and above 0.4 with the questionnaire. Inter-correlation between factors was 0.42 between factor 1 and factor 2, 0.41 between factor 1 and factor 3, 0.20 between factor 2 and factor 3. Correlation analyses showed that factor 1 and factor 2 were positively associated to severity of gambling (r=0.28 for factor 1 and r=0.51 for factor 2). Factor 3, that referred to beliefs about negative consequences of gambling, showed no correlation with severity of gambling (r=0.10) and we decided to remove this from the final version of the questionnaire.

The final version of the questionnaire consisted of 10 items with two sub-scales (5 items each). The first factor referred to negative metacognitions about the uncontrollability of gambling and, accordingly, we named it 'negative metacognitions about gambling'. The second factor pertained to positive metacognitions about the usefulness of gambling as cognitive-affective self-regulatory strategy. We labelled this factor 'positive metacognitions about gambling'.

Study 2: Exploration of the Factor Structure and Preliminary Examination of the Predictive and Divergent Validity of the MGQ in a Clinical Sample

We conducted a second study to explore the factor structure and test the predictive and divergent validity of the MGQ factors in a clinical sample. In accordance with the metacognitive model of psychopathology, metacognitions should be associated to both the initiation and propagation of gambling episodes as well as gambling symptoms severity (Spada, Caselli, Nikčević and Wells, 2015). In view of this, we chose a weekly measure of gambling symptoms (Gambling Symptom Assessment Scale; Kim et al., 2009) and a more general severity index of gambling disorder (SOGS) as dependent variables to test the predictive validity of the MGQ factors. Furthermore, in order to test the divergent validity of the MGQ factors, we also administered the Gamblers' Beliefs Questionnaire (GBQ; Steenbergh et al., 2002), which assesses gambling-specific biased beliefs, and the Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith, 1983) to control for negative affect.

Method

Participants

The sample comprised a consecutive series of 110 (20 females) patients with diagnosis of gambling disorder (DSM-5; (American Psychiatric Association, 2013) seeking treatment from a variety of gambling services in the Milan (Italy) area. Permission for running the study was granted by the ethics committee at Studi Cognitivi. All patients, who were fluent in Italian, identified gambling as their primary problem for which they were seeking psychological treatment. The mean age for the

total sample, which consisted primarily of Caucasians, was 46.8 years (SD=12.7) and the age range was 19-70 years. The mean duration of problematic gambling was 9.3 years (SD=7.6 years). Participants reported mean scores on the SOGS of 12.0 (SD=3.6).

Measures

The Metacognitions Gambling Questionnaire (MGQ).

The MGQ is a 10-item self-report questionnaire developed in Study 1. Higher scores represent higher levels of metacognitons about gambling.

Hospital Anxiety and Depression Scale (*HADS*; Zigmond and Snaith, 1983).

The HADS consists of 14 items, seven assessing anxiety and seven depression. Higher scores represent higher levels of anxiety and depression. The scale possesses good validity and reliability and has been widely used in both clinical and non-clinical research samples (Zigmond and Snaith, 1983).

The Gamblers' Beliefs Questionnaire (GBQ, Steenbergh et al., 2002).

The GBQ was developed as a 21-item self-report questionnaire used to assess gambling-specific cognitive distortions. Each item on the GBQ consists of a statement that represents a gambling-specific cognitive distortion (e.g., "When I am gambling, 'near misses' or times when I almost win remind me that if I keep playing I will win"). Respondents rate their level of agreement on a seven-point scale from strongly agree to strongly disagree. Higher total scores indicate greater levels of gambling-specific cognitive distortions. A revised 21-item version of the English GBQ was used for this study with the Italian version showing good psychometric properties (Marchetti et al., 2016).

The Gambling Symptom Assessment Scale (G-SAS; Kim et al., 2009).

The G-SAS is a 12-item self-rated scale designed to assess the change of gambling symptoms during treatment. There are ten items in the scale and each item can generate a score of between zero and four: total scores range from zero to 48. All items ask for an average symptom presentation based on the previous 7 days. The scale possesses good psychometric properties (Kim et al., 2009).

South Oaks Gambling Screen (SOGS; Lesieur and Blume, 1987).

See description in Study 1.

Procedure

Participants were informed that the purpose of the study was to examine "Beliefs about gambling". After giving informed consent participants were instructed to provide demographic details and complete the batch of questionnaires administered. All participants were debriefed following completion of the questionnaires.

Results

Confirmatory Factor Analysis

Firstly, a confirmatory factor analysis (CFA) was conducted on the data obtained from the factor-validation sample using LISREL 8.8 (Jöreskog and Sörbom, 1996). We compared two models. In Model 1 we defined a single latent variable with all 10 items as indicators. In Model 2 we tested a conceptual two factor solution with negative metacognitions about gambling as a first unique factor and positive metacognitions about gambling as a second unique factor. We also evaluated the model defining the items as continuous indicators, and using maximum likelihood estimation that assumes multivariate normality of the item scores. The Root Mean Square Error of Approximation (RMSEA), which indicates the closeness of fit and is sensitive to the mis-specification of the measurement model (the factor loadings), was employed to evaluate the data fit together with the Comparative Fit Index (CFI) and the Non-Normed Fit Index (NNFI) as incremental fit indexes. The RMSEA cut-off values close to 0.08 demonstrate adequate fit of the model (Browne & Cudeck, 1993; Hu & Bentler, 1999) and values close to or above 0.95 for the CFI and NNFI support an excellent fit. Model 1 resulted in a RMSEA of 0.22, a CFI of 0.75 and a NNFI of 0.68. Model 2 resulted in RMSEA of 0.07, a CFI of 0.96 and a NNFI of 0.95. Model 2 (the two factor solution) showed the best data fit with an adequate level. Internal consistencies (homogeneity) were determined by computing Cronbach's alpha. This coefficient was 0.83 for negative metacognitions about gambling, 0.78 for positive metacognitions about gambling. Additionally, Pearson Product-moment correlations between the individual items and the relative factor scores were calculated. All

of these item-total correlations were above 0.6, suggesting that each item correlated well with the factor score. The inter-correlations between negative metacognitions about gambling and positive metacognitions about gambling was 0.35.

Predictive and Divergent Validity

Descriptive statistics and inter-correlations for all the self-report measures are shown in Table 2. An inspection of histograms, skewness and kurtosis ranges and K-S tests showed that all scores were normally distributed. Pearson Product-moment correlations showed that both factors of the MGQ were positively and significantly correlated with both gambling symptoms and gambling severity. Results also indicated that GBQ and depression were positively and significantly correlated with the gambling symptoms and gambling severity, whilst anxiety was only significantly correlated with gambling symptoms.

Two hierarchical regression analyses (see Table 3) were run in order to evaluate divergent validity (i.e., the contribution of metacognitions about gambling towards gambling symptoms and gambling severity scores whilst controlling for gamblers' biased beliefs and negative affect). Anxiety was excluded from the second analysis because of the absence of a significant correlation with gambling severity. Gender and age were excluded from both analyses because of the same reason.

Firstly, a hierarchical regression analysis was run with gambling symptoms entered as the outcome variable, negative affect and gambling-specific biased beliefs entered in step 1, and positive metacognitions about gambling and negative metacognitions about gambling in step 2. Results of this analysis indicated that both MGQ factors accounted for 5.0% (p=.01) of variance in G-SAS above that accounted for by the other predictors in the model (25%, p<.001). An inspection of the final equation revealed that negative metacognitions about gambling and anxiety were the only variables significantly associated to gambling symptoms.

A second hierarchical regression analysis was run with gambling severity entered as the outcome variable, depression and gambling-specific biased beliefs entered in step 1, and positive metacognitions about gambling and negative metacognitions about gambling in step 2. Results of this analysis indicated that both MGQ factors accounted for 6% (p=.01) of variance in gambling severity over and above the variance accounted for by other predictors (11%, p<.01). An inspection of the final equation revealed that negative metacognitions about gambling and gambling-specific biased beliefs were the only variables significantly associated to gambling severity.

Study 3: Examination of the Prospective Predictive Validity of the MGQ in a Clinical Sample

We conducted a third study to explore the prospective predictive impact of MGQ factors in a clinical sample. Based on the metacognitive model of addictive behaviours (Spada, Caselli, Nikcevic and Wells, 2015; Spada, Caselli and Wells, 2013) we hypothesized that: (1) metacognitions about gambling would positively correlate with negative affect and gambling severity respectively; and (2) metacognitions about gambling would be a prospective predictor of gambling severity. We expected that the relation between metacognitions about gambling severity at time 1 and gambling severity measured three months later (time 2) would be independent of gambling severity, gambling-specific biased beliefs and negative affect measured at time 1.

Method

Design

We employed a longitudinal design with data collection occurring at two time points. At time 1 we collected data on metacognitions about gambling, gambling-specific biased beliefs, negative affect and gambling severity. At time 2 (3 months after time 1) we collected data on gambling severity.

Participants

The sample comprised a consecutive series of 87 (14 females) patients that were selected by interviewing individuals who met inclusion criteria and accepted voluntarily to participate in the study prior to commencing an outpatients treatment for gambling disorder that included psycho-

social support, psychiatric advice, psycho-educational and coping skills interventions that was delivered on weekly basis. All patients were diagnosed with gambling disorder in accordance with DSM-5 criteria (APA, 2013). Inclusion criteria were: (1) having gambling disorder as a primary diagnosis; (2) not being diagnosed with other substance use disorders; (3) not being diagnosed with progressive cerebral traumas or cognitive deficits; and (4) not receiving psychopharmacologic treatment. The mean age for the total sample, which consisted primarily of 94.3% of Caucasians and 3.4% Latin Americans, 2.2% of Africans, was 45.9 years (SD=13.5) and the age range was 19-65 years. The mean year of education was 9.9 years (SD=3.1 years). The mean duration of problematic gambling was 8.5 years (SD=6.9 years).

Materials

Hospital Anxiety and Depression Scale (*HADS*; Zigmond and Snaith, 1983).

See description in Study 2.

The Gamblers' Beliefs Questionnaire (GBQ, Steenbergh et al., 2002).

See description in Study 2.

The Metacognitions about Gambling Questionnaire (MGQ).

The MGQ is the self-report questionnaire developed in Study 1. Higher scores represent higher levels of metacognitons about gambling.

South Oaks Gambling Screen (SOGS; Lesieur and Blume, 1987*).*

See description in Study 1.

Procedure

Ethics approval for the study was granted by the ethics committee at Studi Cognitivi. Participants were informed that the purpose of the study was to examine "Beliefs about gambling". All patients were informed that data provided in the study would be treated with the strictest confidence and that participation in the research project was entirely voluntary. Following a brief introduction to the project and the granting of written informed consent patients were instructed, both verbally and in written form, to complete the baseline measures. After 3 months all patients were located and

screened about their gambling activities in a face-to-face meeting by the same researcher as at baseline. All patients were debriefed following completion of these measures.

Results

Data Configuration and Descriptive Statistics

Descriptive statistics for all variables are presented in Table 4. The data configuration procedure was undertaken considering gambling severity at time 2 as the dependent variable.

An inspection of histograms, skewness and Kurtosis coefficients showed that all measures were distributed normally. We then tested for the presence of multivariate outliers by calculating the distance of Mahalanobis (D^2), which identified 1 multivariate outlier (n=87). This was eliminated from further analyses to ensure a linear relationship between variables. The coefficient of Mardia, which represents the multivariate kurtosis coefficient, was 75.04. This coefficient was not greater than the critical value (80.0) for an asymmetrical multivariate distribution, indicating a multivariate normal distribution.

An inspection of the graphical distribution of D^2 and Q-Q plots supported this finding. We then examined multi-collinearity using the tolerance index (*Ti*) and the variance inflation factor (VIF). A *Ti* of more than 0.02 and a value less than 5.0 for VIF are considered reliable cut-off points for the absence of multicollinearity. The tolerance index goes from .48 to .91 and the VIF from 1.10 to 2.14. These analyses supported the absence of multicollinearity between variables. An analysis of residuals (residual Q-Q plots, skewness, kurtosis, correlations with variables) was performed to identify non-linearity, to support homoscedasticity and to identify the absence of significant correlation. The Durbin-Watson statistic was 1.85 ensuring the absence of autocorrelation. The inspection of Cook's distance showed that no participants' data would change the regression analyses coefficients significantly.

An inspection of missing data patterns showed that missing data was 11.3% with a random distribution between time-points as confirmed by a non- significant Little's MCAR test (x^2= 7.34,

p>.05). We then adopted a multiple imputation technique with the expectation-maximization model to manage missing data.

Correlational Analysis

To test whether metacognitions about gambling would positively correlate with gambling severity at time 2 we ran a series of correlations on pooled study variables once multiple imputed. Pooled correlations showed that gambling severity at time 2 was positively associated to negative metacognitions about gambling and positive metacognitions about gambling (See Table 4). All other variables as measured at time 1 were positively associated with gambling severity at time 2.

Regression analysis

To test weather metacognitions about gambling measured at time 1 predicted gambling severity three months later independently of gambling severity, anxiety, depression and gambling-specific biased beliefs measured at time 1, a hierarchical regression analysis was run on the pooled study variables (see Table 5). Gambling severity at time 2 was entered as dependent variable. Gambling severity, anxiety, depression at time 1 were entered on step 1, gambling-specific cognitive distortions were entered on step 2, positive metacognitions about gambling and negative metacognitions about gambling at time 1 were entered on step 3. Gender was excluded because of the absence of a significant correlation with gambling severity (r = -.03). Metacognitions about gambling were found to account for a significant 5-10% (p<0.001) in variance over and above all other predictors among the pooled regression analysis. A closer inspection of the final equation in the analysis reveals that only gambling severity and negative metacognitions about gambling were significant predictors of gambling severity as measured at time 2.

Discussion

Expanding upon the extensive research base which has demonstrated the key role of metacognitions in addictive behaviours (Spada, Caselli, Nikčević and Wells, 2015), we conducted three studies aimed at developing and validating a self-report questionnaire on metacognitions about gambling and test their prospective role in predicting gambling severity. In Study 1 we ran a principal

components factor analysis on a community sample of gamblers. Results from this study suggested a two factor solution for the newly developed MGQ comprising of: positive metacognitions about gambling and negative metacognitions about gambling. The internal consistencies (homogeneity) of the factors were satisfactory.

The structure of the MGQ was broadly confirmed in Study 2 through a confirmatory factor analysis in a clinical sample of patients presenting with gambling disorder. Results revealed that positive and negative metacognitions about gambling were positively correlated with gambling measures (providing support for predictive validity) and with gambling-specific biased beliefs. The mutual relationship between metacognitions and biased beliefs can be explained by potentially different pathways. Firstly, biased beliefs may be the result of metacognitive knowledge, for example positive metacognitions about gambling can generate or empower biased beliefs by selecting cognitive strategies like the monitoring of potential 'good reasons' for starting gambling activity or reducing the impact of its negative consequences (Caselli and Spada, 2015). Secondly, negative metacognitions about uncontrollability can lead to a reduction of an appropriate goal progress monitoring and consequently hinder the disconfirmation of biased beliefs. Data also indicated that negative metacognitions about gambling were associated with gambling severity, controlling for negative affect and gambling-specific cognitive distortions (providing support for divergent validity).

Study 3 provides evidence for the prospective role of metacognitions about gambling in predicting gambling severity over and above other well-established predictors. Firstly, positive and negative metacognitions about gambling were positively associated to subsequent gambling severity. Secondly, negative metacognitions about gambling (time 1) prospectively predicted subsequent gambling severity (time 2) independently from gambling severity, gambling-specific biased beliefs and negative affect as measured at time 1.

These findings demonstrate the utility of the MGQ in predicting gambling behaviour in both community and clinical samples. These results are consistent with early explorative findings on the

role of metacognitions in gambling disorder (Lindberg, Fernie and Spada, 2011; Spada, Giustina, Rolandi, Fernie and Caselli, 2015) and add to the argument for applying metacognitive theory to the understanding of gambling disorder in a similar way to what has been employed for other addictive behaviours (Spada, Caselli, Nikčević and Wells, 2015; Spada, Caselli and Wells, 2013). According to the metacognitive theoretical tenet, positive metacognitions about gambling can implicitly or explicitly motivate toward gambling activity as a means of coping with negative intrusive thoughts or negative affect to achieve self-regulation (Wells, 2009). In support of this association between positive metacognitions about gambling and gambling severity is stronger in non-clinical gamblers rather than in clinical gamblers. In addition to this, negative metacognitions about gambling seemed to play an even more relevant role in predicting subsequent gambling severity in clinical samples. This may happen because of their preeminent role in sustaining the perseveration of gambling once it started. Believing gambling activity as out of control may: (1) reduce the level of meta-awareness about the real extent of control possibilities; (2) prevent the effortful exertion of self-control over gambling; (3) promote the persistency of gambling; and (4) hinder disconfirmation of such metacognitions (Wells, 2009; Spada, Caselli and Wells, 2013).

Findings also highlight the potential utility of employing techniques and principles of MCT (Wells, 2009), which have been found to be effective in the treatment of anxiety and mood disorders (Normann, van Emmerik and Nexhmedin, 2014), in aiding the discontinuation of problematic gambling. The techniques that could be employed to tackle problematic gambling may include the re-appraisal of metacognitions as well as interventions aimed at modifying such metacognitive knowledge, such as detached mindfulness, attention training and the postponement of gambling (Spada, Caselli, Nikčević, and Wells, 2015)

It should be noted that the present results are preliminary in nature. First, social desirability, self-report biases, context effects and poor recall may have contributed to errors in self-report measurements. In addition, the use of internet-based snowballing recruitment techniques is subject to biased estimates in Study 1. Furthermore, the presence of concurrent psychological disorder

(which could account for the observed differences in outcome measures) was not assessed. However, controlling for anxiety and depression does provide a degree of confidence in the specificity of the results. Third, the clinical samples in studies 2 and 3 were moderately gender imbalanced. Finally, the clinical sample was relatively small in size and some patients had received previous treatment (9.9% in study 2 and 7.8% in study 3) which may have exposed them to the identification and exploration of cognitive constructs. However, standard treatment for gambling disorder does not typically include the examination of metacognitions assessed here. Thus the experience of treatment may not be particularly significant in explaining the current findings.

It is clear that future studies are required to confirm the psychometric properties of the MGQ. In addition, studies are required to examine the sensitivity of the different factors of the MGQ to treatment effects and recovery if these are to prove useful as treatment evaluation markers.

In summary this study confirms that metacognitions about gambling are a prospective predictor of gambling. It is suggested that the efficacy of metacognitive therapy in the treatment of gambling disorder should be explored.

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Conflict of interest

None.

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Conflict of interest

All authors declare they have no conflict of interest.

Appendix

Metacognitions about Gambling Questionnaire (MGQ)

This questionnaire is concerned with beliefs people hold about gambling. Listed below are a number of beliefs that people have expressed. Read each item and say how much you generally agree with it by circling the appropriate number. Please respond to all the items. There are no right or wrong answers

	Do not agree	Agree slightly	Agree moderately	Agree very much	Factor
1. Gambling can get me away from my worries	1	2	3	4	PMG
2. Gambling makes my worries more bearable	1	2	3	4	PMG
3. Thinking about gambling is difficult to control	1	2	3	4	NMG
4. Gambling helps to stop worry about my problems	1	2	3	4	PMG
5. When I start to gamble I cannot stop	1	2	3	4	NMG
6. I cannot stop thinking about gambling	1	2	3	4	NMG
7. Gambling reduces my worries	1	2	3	4	PMG
8. When I gamble nothing can distract me	1	2	3	4	NMG
9. Gambling helps to control my thoughts	1	2	3	4	PMG
10. Gambling absorbs all my mental resources	1	2	3	4	NMG

Note: This is the English translation of the validated Italian version of MGQ. NMG = Negative Metacognitions about Gambling, PMG= Positive Metacognitions about Gambling.

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Table 1 Factor loadings for individual items of the MGQ in Study 1 and Study 2 based on exploratory factor analyses

	F1	F2	F3	Communality
Factor 1: Negative Metacognitions about Gambling				
(1) I cannot stop thinking about gambling	**.80**	.24	.12	.71
(2) Thinking about gambling is difficult to control	**.77**	.24	.09	.65
(3) Gambling absorbs all my mental resources	**.72**	.14	.24	.60
(4) When I start to gamble I cannot stop	**.71**	.19	.11	.54
(5) When I gamble nothing can distract me	**.69**	.09	.15	.50
Factor 2: Positive Metacognitions about Gambling				
(1) Gambling reduces my worries	.18	**.86**	.08	.77
(2) Gambling makes my worries more bearable	.19	**.82**	.06	.71
(3) Gambling can get me away from my worries	.02	**.76**	.12	.59
(4) Gambling helps to stop worry about my problems	.30	**.74**	.03	.64
(5) Gambling helps to control my thoughts	.22	**.73**	.02	.57
Factor 3: Metacognitions about Consequences of Gambling				
(1) Gambling makes me lose power over my life	.18	.01	**.81**	.68
(2) Gambling in this way means my mind is weak	.07	.24	**.79**	.69
(3) Gambling can make me lose my mind	.25	.05	**.77**	.65
(4) Thoughts of gambling should always been avoided	.11	.01	**.67**	.46
(5) I should been able not to think about gambling	.33	.03	**.65**	.53

Table 2 Means, standard deviations, ranges and inter-correlations of the Study 2 variables.

	Alpha	X	SD	Range	G-SAS	SOGS	HADS-A	HADS-D	GBQ	NMG	PMG
Gender					.17	.07	.22*	-.15	.15	-.06	-.11
G-SAS	.91	14.6	11.3	0-44	1	.18	.49**	.47**	.24*	.37**	.25**
SOGS	.75	12.0	3.6	4-28	-	1	.13	.19*	.33**	.36**	.22**
HADS-A	.83	13.0	5.3	0-21	-	-	1	.70**	.26**	.23*	.20*
HADS-D	.85	7.6	4.3	0-18	-	-	-	1	.25**	.23*	.34**
GBQ	.90	106.6	27.2	34-147	-	-	-	-	1	.30**	.17
NMG	.83	13.7	4.4	5-20	-	-	-	-	-	1	.35**
PMG	.78	12.4	4.3	5-20	-	-	-	-	-	-	1

Note. n=110. G-SAS: Gambling Symptoms Assessment Scale; SOGS=South Oaks Gambling Scale; HADS-A= Hospital Anxiety and Depression Scale - Anxiety; HADS-D=Hospital Anxiety and

Depression Scale - Depression; GBQ= Gamblers' Beliefs Questionnaire; NMG=Negative Metacognitions about Gambling; PMG=Positive Metacognitions about Gambling.
*p<.05; **p<.01.

Table 3 Hierarchical multiple linear regression statistics with G-SAS and SOGS as dependent variables.

	G-SAS					SOGS				
				95% Confidence Interval					95% Confidence Interval	
	B	**SE**	**t**	**LL**	**UL**	**B**	**SE**	**t**	**LL**	**UL**
Step 1										
HADS-A	-.61	.27	-2.44**	-1.20	-.15	-	-	-	-	-
HADS-D	.64	.33	2.12	-.13	1.22	.08	.08	1.07	-.06	.26
GBQ	-.04	.04	-1.06	-.10	0.03	-.04	.01	-3.38	-.06	-.02
	Adj r^2 = .25**		.			*Adj* r^2 = .11**				
	r^2 *Change* = .25					r^2 *Change* =.11				
Step 2										
HADS-A	-.57	.26	-2.32*	-1.16	-.11	-	-	-	-	-
HADS-D	.55	.34	1.79	-.18	1.19	.03	.08	.37	-.12	.21
GBQ	-.01	-04	-.36	-.08	.06	-.03	.01	-2.63**	-.05	-.01
NMG	.59	.21	2.57**	.14	.95	.21	.08	2.55**	.05	.36
PMG	.09	.27	.38	-.41	.63	.06	.09	.76	-.11	.22
	Adj r^2 = .30*					*Adj* r^2 = .17**				
	r^2 *Change* =.05					r^2 *Change* = .06				

Note. n=110. G-SAS: Gambling Symptoms Assessment Scale; SOGS=South Oaks Gambling Scale; HADS-A= Hospital Anxiety and Depression Scale - Anxiety; HADS-D=Hospital Anxiety and Depression Scale - Depression; GBQ= Gamblers' Beliefs Questionnaire; NMG=Negative Metacognitions about Gambling; PMG=Positive Metacognitions about Gambling

Table 4 Study 3 correlation matrix for the pooled study variables

	Alpha	**Mean**	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. SOGS (Time 2)	.73	10.4	4.6	1	.76**	.24*	.31*	.33*	.56**	.34**
2. SOGS (Time 1)	.75	11.7	3.2	-	1	.15	.17	.39**	.40**	.28**
3. HADS-A (Time 1)	.82	13.1	5.5	-	-	1	.71**	.31**	.23*	.18
4. HADS-D (Time 1)	.84	7.3	4.4	-	-	-	1	.33**	.26*	.37**
5. GBQ (Time 1)	.89	108.5	27.8	-	-	-	-	1	.33**	.27*
6. NMG (Time 1)	.83	13.9	4.4	-	-	-	-	-	1	.36**
7. PMG (Time 1)	.80	12.5	4.5	-	-	-	-	-	-	1

Note. SOGS = South Oaks Gambling Screen; HADS-A = Hospital Anxiety and Depression Scale - Anxiety; HADS-D = Hospital Anxiety and Depression Scale - Depression; GBQ = Gambling Beliefs Questionnaire; NMG = Negative Metacognitions about Gambling, PMG= Positive Metacognitions about Gambling; n=87; *p<.05;**p<.01.

Table 5 Pooled hierarchical regression model with gambling severity at time 2 as the outcome variable.

Predictor (Time 1)	R^2	Adjusted R^2	B	SE	t	95% Confidence Interval LL	95% Confidence Interval UL
Step 1							
SOGS			.99	1.0	10.15**	.80	1.19
HADS-A			.01	.11	.10	-.24	.22
HADS-D			.16	.13	1.22	-.11	.43
	.74-.87**	.52-.75**			.		
Step 2							
SOGS			1.00	.11	9.49**	.80	1.21
HADS-A			.02	.10	.12	-.23	.20
HADS-D			.16	.14	1.18	-.13	.45
GBQ			.02	.02	.11	-.03	.33
	.74-.87**	.52-.75					
Step 4							
SOGS			.88	.10	8.59**	.68	1.08
HADS-A			.01	.09	.02	-.19	.19
HADS-D			.13	.12	1.08	-.11	.37
GBQ			.01	.02	.62	-.02	.04
NMG			.28	.08	3.49**	.12	.43
PMG			.02	.11	.17	-.23	.27
	.79-.93**	.60-.85**					

Note. SOGS = South Oaks Gambling Screen; HADS-A = Hospital Anxiety and Depression Scale - Anxiety; HADS-D = Hospital Anxiety and Depression Scale - Depression; GBQ = Gambling Beliefs Questionnaire; NMG = Negative Metacognitions about Gambling, PMG= Positive Metacognitions about Gambling; LL = Lower Limit; UL = Upper Limit; n=87; *p<.05;**p<.01.

Highlights

- The goal of our studies was to develop a self-report scale of metacognitions about gambling
- We tested psychometric properties in three studies with both community and clinical samples
- Findings supported a solution consisting of positive and negative metacognitions about gambling
- Internal consistency, predictive and divergent validity were acceptable.
- Negative metacognitions were significant prospective predictors of gambling severity.